tific names of the species, however, were at that time unknown to both of us, and the subsequent identification, after our return, was entirely my own work. Mr. Baker, however, has quoted my notes and identifications throughout his book as if they were his own. In many cases he has supplemented them by original notes which must have been drawn from memory—a very unreliable source after a lapse of five years. For instance, on p. 28, he says 'finches were quite abundant,' while they were in reality very scarce, and p. 32 he records 'thrushes' at Glenn's Camp, while we only saw one thrush in Yucatan, which was at another time and place.

Strangest of all, however, is his account of the Trogon. The bird was shot in the cactus thicket, under the circumstances which he describes, was a Motmot and not a Trogon, as my notebook shows, and the only Trogon that we did collect—in fact, the only one we saw—had not a 'rose-colored breast,' but was the *yellow* breasted *T. caligatus*.

In describing the effects of the rarefied air during our ascent of Orizaba, Mr. Baker says: "I was seized with most violent symptoms. My head swam, my eyes became bloodshot. * * * * Another of my companions was affected in the same manner." As Mr. Baker and I were together when we desisted in the ascent I must be the one to whom he alludes, and I can only say that for my part the account is grossly exaggerated, nor did I see such signs of distress in my companion. Indeed, Mr. Baker's recollections of the trip seem in many respects very dim, as the opening paragraph of his book shows that he has forgotten the name of the vessel upon which we sailed from New York.

On page 97 Mr. Baker takes occasion to ridicule the naming of the mollusks in the Mexican National Museum, referring to one instance as a 'most ludicrous error.' There is an old saying that "people who live in glass houses should not throw stones," and it seems equally 'ludicrous' to find on page 123 of Mr. Baker's book a figure of our eastern kingbird (*Tyrannus tyrannus*) labelled *T. vociferus;* the white tail-band, which is characteristic of the eastern bird and absent in the other, being brought out prominently in the cut; and yet this figure was drawn by the author especially for this work.

It may seem scarcely worth while to call attention to Mr. Baker's plagiarism as I have done, but unfortunately this is not his first offense, as can be seen on comparing his article on the Round-tailed Muskrat, Proc. Acad. Nat. Sci. Phila., 1889, p. 271, with Mr. F. M. Chapman's earlier paper on the same subject, Bull. Amer. Mus. Nat. Hist., Vol. II., p. 119, and it seems only right that such practice should be exposed.

WITMER STONE.
ACADEMY NAT. SCIENCES PHILA.

SHELLS AS IMPLEMENTS.

PROFESSOR OTIS T. MASON calls attention, in SCIENCE, October 11, 1895, to an illustration of a perforated shell, said to have been used as a scraper, given in von den Steinen's work on 'The Natives of Central Brazil,' and resembling those figured by Holmes in his 'Art in Shell,' Pls. xxvi., fig. 3: xxvii., fig. 1. In shell heaps on the shores of Frenchman's Bay, Mt. Desert Island, I have found numerous valves of the *Mya arenaria* similarly perforated. The greater part seem to have been so pierced by the hard beaks of the common crow, like those found now on beaches. Others, however, show such a rounded perforation as can only have been made by man, and have the edge artificially smoothed. I have always supposed that such smoothing was caused either by the lashing to it, or the insertion, of a wooden handle, and that the object was used as a spoon or ladle. This seems to be corroborated by the circumstance that the inside of one of these shells is covered by a hard incrustation resembling what is often found upon fragments of pottery vessels that have been used as cooking utensils. The edges of the shells show no indication that they have been used as scrapers.

HENRY W. HAYNES.
BOSTON, October 16, 1895.

SCIENTIFIC LITERATURE.

Canyons of the Colorado. By J. W. POWELL, PH. D., LL. D., formerly Director of the United States Geological Survey, member of the National Academy of Sciences, etc., etc. Meadville, Pa., Flood & Vincent, The Chautauqua-Century Press. 1895.

This is a sumptuous volume of 400 quarto

pages, illustrated by over 300 pictures, besides a number of folding panoramas, not paged. It contains fifteen chapters, of which the first four ('The Valley of the Colorado,' 'Mesas and Buttes,' 'Mountains and Plateaus,' 'Cliffs and Terraces') constitute an introduction in the form of a general description of the region traversed by Colorado River. Seven chapters are devoted to the itinerary of the memorable exploration of the canyon in 1869; four chapters contain the itinerary of the supplementary explorations in 1870; and the final chapter is a summary description of the canyon. The introductory and concluding chapters are based on present knowledge of the geography, geology, meteorology and ethnology of the region; the itineraries are also brought up to date, where there is need, by explanatory paragraphs, and while they are in part reprinted from official and other reports they are enriched by extracts from the original journals not hitherto published.

The valley of the Colorado extends from near Yellowstone Park to the Gulf of California, and from the deserts of the Great Basin to the Rocky Mountain front; it is one of the five principal river basins of the United States and bordering territory. It comprises the low-lying desert plains of the far Southwest, the western slope of the main continental divide and the rugged ranges beyond, together with the vast system of plateaus and mesas lying between mountain and desert. In much of this region the 'great stone book' in which the history of the earth is recorded lies open, and the broad expanse of its rocky pages is the paradise of the geologist; throughout much of the region, too, geologic process is so rapid as to catch the eye of the wayfarer and impress the lessons of dynamic geology. Here it was that Powell perceived the significance of the baselevel, and thereby planted the germ of geomorphy—the 'New Geology,' by which the field of the science has been doubled; here, too, he discovered that the high mountain is the young mountain, and that the crust of the earth is responsive to the transfer of load; here, also, other comprehensive generalizations were made whereby the science of the earth was stimulated and raised to a higher plane. Other American geologists, as well as Powell, have gained inspiration in this fortunately conditioned field. Gilbert's concepts became masterly as he traversed the rocky tables and rested in the shadow of the cliffs of the Colorado country, and his memoir on the Henry mountain is still the model geologic monograph; Dutton's magnificent generalizations, of which some are even yet hardly grasped by his contemporaries and followers, were formulated in the same inspiring field; there it was, too, that Holmes developed the genius under which art and earth-science were joined, and his portraiture of plateau and mesa and of cliff and canyon (reproduced in part in the present work) remains a model; it was in the depths of the same canyon that Walcott coördinated paleontology and stratigraphy more perfectly than before, and shaped the ideas now bearing fruit in the policy of the federal survey. Through these students and others the influence of the field was spread over the country and world. Thus the valley of the Colorado is classic ground for the geologist; and with respect to physical geology at least, no other part of the earth has contributed so much to the body of the science.

This is the region which is appreciatively yet succinctly described by its original explorer and most philosophic student in the introductory chapters of his book. The description is at the same time sufficiently popular to be followed by the layman, and sufficiently profound to set forth the principles of the science in considerable fullness; and the chapters accordingly serve the double purpose of depicting the salient features of an interesting region in attractive word painting, and of popularizing newly established principles. Perhaps this part of the book might have been made more useful to students by pointing out the extent to which the principles were developed in the field described; but this is only one of the examples, in which the book abounds, of the elevation of well considered facts and principles above the ego.

The valley of the Colorado is hardly less notable in its aboriginal population than in its geologic features. Within its confines the primitive Shoshoni, embracing the 'Diggers' of early explorers, the warlike Apache, the peaceful

Pima, the mystery-loving Pueblo Indians, and other interesting tribes are found, while ruins of cliff houses, cavate dwellings, and plains villages abound. The living Indians discovered by the explorer spoke divers tongues; their habits of life and social customs were diverse; they had ceremonials, beliefs, systems of philosophy, many in number yet more or less closely related among one another, and so widely diverse from those of civilized men as to be rarely understood; their arts were varied yet related, and sometimes different from, though related to, those represented in the prehistoric relics; and the traditions of the tribes indicated extended migrations, peaceful possession alternating with savage strife, and successive occupancy of various districts by different tribes in prehistoric as well as in early historic times.

Thus the ethnic problems were many and interesting, and, since the inhospitality of the district retarded white invasion, the opportunities for ethnic research were exceptionally favorable. Impressed by the characteristics of the native races, the pioneer explorer began studying and recording the native languages, and this line of research was subsequently continued in connection with the federal survey of the Rocky mountain region and still later in the Bureau of American Ethnology; and the study finally grew into a classification of the native races of America north of Mexico on a linguistic basis. Moreover, collaborators were enlisted in the ethnic work as in the geologic studies, and some of these found inspiration in the same district; the Stevensons, husband and wife, enriched the National Museum with collections from different native tribes, and afterward elucidated the mythology of some of the Pueblo peoples; the Mindeleff brothers made extended and fruitful archeologic surveys; Cushing affiliated with the devout Zuñi priesthood, and brilliantly interpreted their thaumaturgic rites and their curiously complicated symbolism and ceremonial; and the influence of the ethnologists, like that of the geologists, extended over the country and the world. Thus the valley of the Colorado is classic ground for the ethnologist, and the dust of the flower bloomed in the desert has fertilized all other branches of the growing science of man.

In his introductory chapters Powell describes the native tribes and illustrates their characteristics and handiwork as they are known in the light of the science developed in the district, while the itinerary depicts them as they were when first seen by white men. In the description the tribesmen are not dissevered from the district, but treated as an integral part of a natural assemblage of features, like the distinctive flora and fauna—for few of the historic Indians rose to the control of nature, and most of the tribes closely reflected their environment in their habits and institutions. Except that characteristic myths are introduced in the itineraries and that a large number of illustrations pertain to primitive artisans and their art, ethnology is kept somewhat in the background throughout the work, though the ethnology and archeology of the region are happily characterized here and there, particularly toward the end of the fourth chapter.

The itinerary of the first descent of the red-tinted river is a simple narrative of daily events, jotted down by a busy and hard-worked explorer, yet the events collectively form the most remarkable chapter in the history of American exploration; for the writer, albeit buffeted by waves and worn by anxiety for his companions, albeit weary, hungry, drenched and chilled as he wrote, was still a poet-naturalist; and to those who appreciate thrilling adventure, or direct contact with and conquest over nature, the pages are among the most attractive in our language. The little party embarked May 24, 1869, at Green River City, on a river reputed among whites and Indians as too swift and turbulent for passage. Nearly every day was one of peril; oars were broken in the fierce current, boats were overturned in the rapids and crushed against the rocks, apparatus and clothing were swallowed by the waters, food supplies were spoiled and lost, and still the cataracts grew higher, the rapids more terrific; again and again the rushing waters overcame the strength and skill of the boatmen, and the little vessels were engulfed in raging cataracts, sucked down in whirlpools, or rolled over and over on the jagged rocks; once and again leader and men

were washed from their boats to be barely rescued and resuscitated by their mates; yet day after day, for more than three months, the fleet pushed on. The party was a picked one from among the hardiest of frontiersmen, and the record of their coolness, courage and fidelity through ceaseless toil and in the face of hourly peril is a picture of the nobility of manhood done in strong colors. But at last the expedition reaches a roaring cataract more forbidding than those already passed, and at the sight of it the spirit of the senior boatman is broken; he and others regard it as certain death to attempt the passage, and decide to trust themselves rather to the inhospitable deserts. There is no mutiny—the situation is far too desperate—all are alike in the valley of the shadow; but all night long the leader paces up and down a little path on a few yards of sand beach by the river side, weighing the chances. At daybreak he decides to go on, and secures anew the wavering allegiance of one after another of the party; but three will not be persuaded, and set out over the rocks—to their death. The leader, with his five companions, shoots the cataract more easily than anticipated, and three days later reaches the mouth of the Rio Virgen, with friendly pioneers already on the lookout for their wreckage.

In his preface the author says, 'The exploration was not made for adventure, but purely for scientific purposes, geographic and geologic, and I had no intention of writing an account of it, but only of recording the scientific results;' and although the chapters are of thrilling interest as a record of adventure alone, yet from beginning to end of the adventurous expedition the primary purpose was kept in view; directions and distances were platted and checked by sextant observations that the river might be mapped; the rocks were studied that the geologic history of resources of the province might be made known; the turbulent stream was studied as a geologic agent, and the effects of storms, tributaries, and changes in declivity were examined to the end that the processes of river work might be better understood. Despite the severity of the trip, few days passed without the record of important scientific observations or generalizations.

The final chapter describes the Grand Canyon as a geographic feature, as a record of geologic product and process, and as one of the most impressive scenic features of the world. "The Grand Canyon is a gorge 217 miles in length, through which flows a great river with many storm-born tributaries. It has a winding way, as rivers are wont to have. Its banks are vast structures of adamant, piled up in forms rarely seen in the mountains" (page 379). The author's impressions of the gorge as a scenic feature are best expressed in his own words:

"The wonders of the Grand Canyon cannot be adequately represented in symbols of speech, nor by speech itself. The resources of the graphic art are taxed beyond their powers in attempting to portray its features. Language and illustration combined must fail. The elements that unite to make the Grand Canyon the most sublime spectacle in nature are multifarious and exceedingly diverse. The Cyclopean forms which result from the sculpture of tempests through ages too long for man to compute, are wrought into endless details, to describe which would be a task equal in magnitude to that of describing the stars of the heavens or the multitudinous beauties of the forest with its traceries of foliage presented by oak and pine and poplar, by beech and linden and hawthorn, by tulip and lily and rose, and by fern and moss and lichen. Besides the elements of form, there are elements of color, for here the colors of the heavens are rivaled by the colors of the rocks. The rainbow is not more replete with hues. But form and color do not exhaust all the divine qualities of the Grand Canyon. It is the land of music. The river thunders in perpetual roar, swelling in floods of music when the storm gods play upon the rocks and fading away in soft and low murmurs when the infinite blue of heaven is unveiled. With the melody of the great tide rising and falling, swelling and vanishing forever, other melodies are heard in the gorges of the lateral canyons, while the waters plunge in the rapids among the rocks or leap in great cataracts. Thus the Grand Canyon is a land of song. Mountains of music swell in the rivers, hills of music billow in the creeks, and meadows of music murmur in the rills that ripple over the rocks. Altogether it is a symphony of multitudinous melodies. All this is the music of waters. The adamant foundations of the earth have been wrought into a sublime harp, upon which the clouds of the heavens play with mighty tempests or with gentle showers.

"The glories and the beauties of form, color and sound unite in the Grand Canyon—forms unrivaled

even by the mountains, colors that vie with sunsets, and sounds that span the diapason from tempest to tinkling raindrop, from cataract to bubbling fountain. But more, it is a vast district of country. Were it a valley plain it would make a State. It can be seen only in parts from hour to hour and from day to day and from week to week and from month to month. A year scarcely suffices to see it all. It has infinite variety, and no part is ever duplicated. Its colors, though many and complex, at any instant change with the ascending and declining sun; lights and shadows appear and vanish with the passing clouds, and the changing seasons mark their passage in changing colors. You cannot see the Grand Canyon in one view, as if it were a changeless spectacle from which a curtain might be lifted, but to see it you have to toil from month to month through its labyrinths. It is a region more difficult to traverse than the Alps or the Himalayas, but if strength and courage are sufficient for the task, by a year's toil a concept of sublimity can be obtained, never again to be equaled on the hither side of Paradise."

Considered as a whole, the book is a monograph on a region classic in geology and ethnology, and a summary history of the development of science in this region. It is at the same time a record, unique in its fullness, of a memorable exploratory trip, the most arduous, save that of Francisco Pizarro on the headwaters of the Amazon, in the annals of America, and one saved from the verdict of foolhardiness only by success. No geologic or ethnologic library or collection of Americana will be complete without it. As a historical treatise the work might have been made more valuable by setting forth the origin and development of great generalizations, and tracing the growth of knowledge concerning the region and its various aspects, though by such treatment its simplicity and unity would have been impaired.

From preface to summary the pages teem with matter-of-fact reason, mingled with poetic imagery, expressed in clear and fluent language. The strong personality of the author can be read only between the lines of scientific observation or generalization, or of the narrative of patient and persevering mastery of natural forces in the canyon. Reading between the lines, the philosophy of the author may be recognized in its practical application. He explored the canyon to the end that knowledge might be gained; he trained collaborators in geology and ethnology, giving them freely of his acute observations and profound generalizations, to the end that knowledge might be diffused; he would have it that the book should be a monument to his companions in the exploration, including those who faltered at the eleventh hour; and self is lost in the immortality of knowledge useful to mankind.

The publishers have done their part well. The print is large and clear and carefully proofread; the paper is good, and the illustrations are ample and well selected. Nearly all of the illustrations have been used before, either in governmental publications or in magazines, and to some readers this fact may convey a bad impression; but all of the illustrations have grown out of the work of the author. In some cases, too, it might have been desirable to connect the illustrations more closely with the text by legend or otherwise, and this was perhaps avoided only through desire to economize space. The cloth binding is good, and the binding in leather is excellent. W J McGEE.

Petrology for Students. An introduction to the study of Rocks under the Microscope. By ALFRED HARKER. Published by Macmillan & Co., New York. 1895. Price, $2.00.

As the author states in the preface, this text-book is prepared especially for English students, nevertheless, it will be found very useful for those beginning the study of petrography in this country who wish a text-book written in English. No systematic account of the crystallographic and optical properties of minerals has been attempted, and for such information the student is referred to the translation of Professor Rosenbusch's volume on the rock-making minerals. But as an introduction to the study of the rocks themselves a number of useful observations of a general nature are presented upon the characters of minerals in this section, and especially the latest methods of distinguishing the different varieties of feldspar. In treating so complex a subject as the optical properties of minerals in thin sections in such a condensed manner it is doubtful whether the author can meet the wants of a beginner. It